Space Weather Technical Forecast

Issued on Sunday, 07 August 2022 at 13:07 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

---

Space Weather Forecast Headline: G1/Minor Storm intervals likely, mainly Day 2 (08 Aug). Chance of Active fluence by Day 4 (10 Aug).

Analysis of Space Weather Activity over past 24 hours
Solar Activity: Solar activity has been Very Low over the past 24 hours with only B-class flares. There are currently seven sunspot regions on the disc, including three regions approaching the southwest limb, two small unipolar regions in the southeast quadrant, and two further regions which have recently rotated onto the northeast limb. All of these are small and simple with no significant magnetic complexity. No Earth-directed CMEs have been observed.

Solar Wind / Geomagnetic Activity: The solar wind, as measured by DSCOVR at L1, has shown a transition into a weak high speed stream, likely from CH09. Wind speeds were at background levels below 350 km/s, but started to rise from 07/0000 UTC and are now varying between 400-450 km/s. The density has been average or above average. The total interplanetary magnetic field, Bt, started weak but rose steadily to become moderate, peaking at 14nT around 07/0800 UTC. The north-south component, Bz, was mostly northward oriented, but gradually became moderately southward directed after 07/0045 UTC. The Phi angle was mostly negative (towards the Sun), but switched to positive around 06/2230 UTC. Geomagnetic activity was Quiet to Unsettled (Kp 0-3).

Energetic Particles / Solar Radiation: The high energy proton flux (10 MeV), as measured by GOES-16, was at background levels. The high energy electron flux (greater than 2 MeV) was at background levels. Electron fluence was well below the Active (1e8 integrated pfu) threshold on a steady trend. 1.7e6 integrated pfu was observed at 07/0000 UTC.

Four-Day Space Weather Forecast Summary
Solar Activity: Low or very low solar activity is forecast with only a slight chance of an M-class flare.

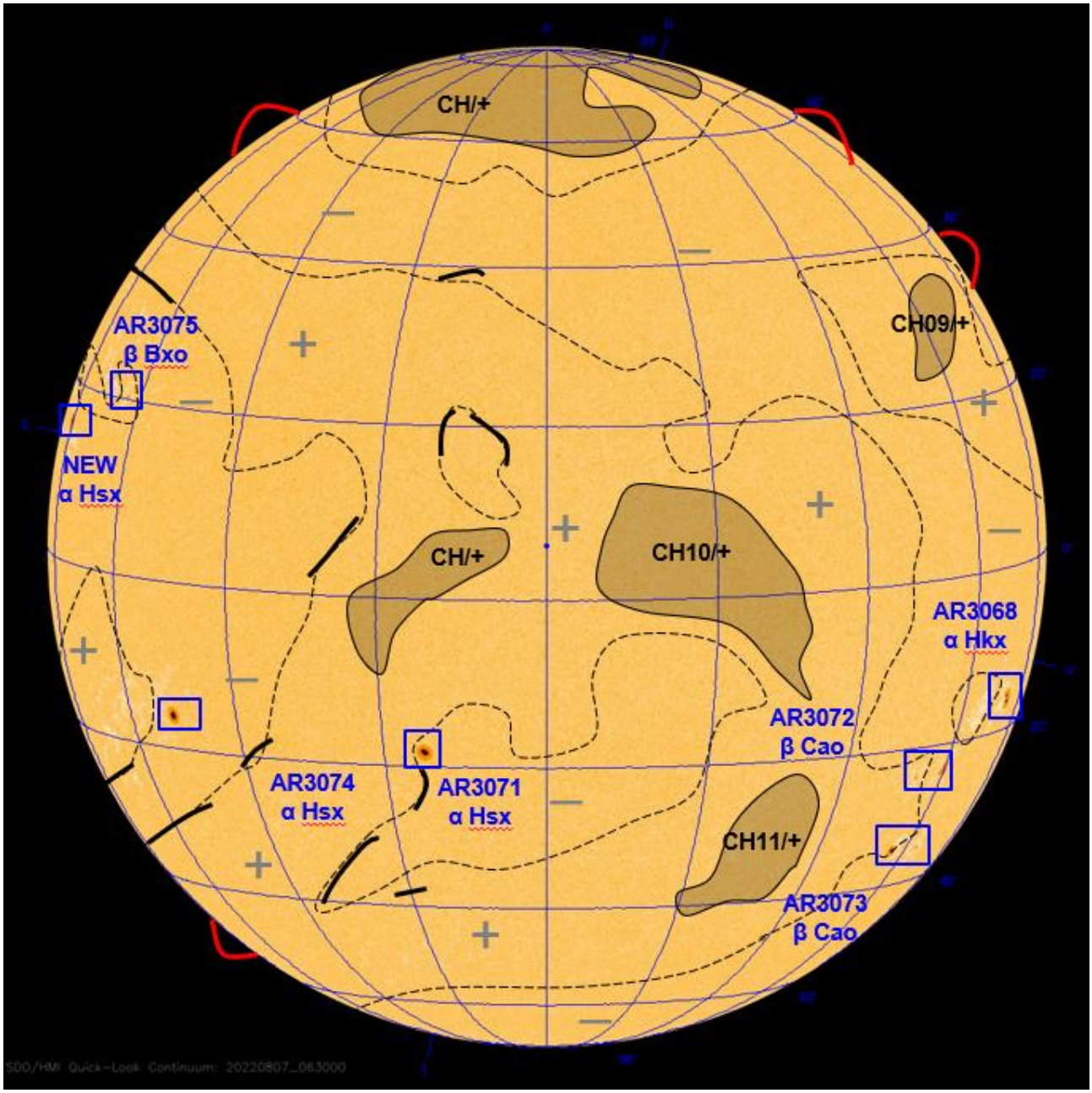
Solar Wind / Geomagnetic Activity: There are no Earth-directed CMEs. Wind speeds are currently slightly elevated, likely due to a weak fast wind from CH09/+. The most notable feature is a large central disc coronal hole CH10/+. Expected fast wind arrival is most likely on Day 2 (08 Aug), but possibly on Day 3 (09 Aug). Wind speeds are likely to reach around 550-600 km/s. Geomagnetic activity will initially be Quiet to Unsettled with Active spells possible, with a slight chance of isolated G1/Minor Storm intervals on Day 1 due to CH09 fast wind. Activity rising to Unsettled to Active with G1/Minor Storm intervals likely when CH10 fast wind arrives, likely Day 2. Easing to Quiet to Unsettled by Day 4 (10 Aug).

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) is expected to remain at background levels. The high energy electron flux (greater than 2 MeV) is likely to increase through the period, due to fast wind charging, perhaps peaking at high during periods of diurnal maximum. The associated 24 hr fluence is expected to remain below the Active threshold (1e8 integrated pfu), but with a rising trend, and a chance of rising above Active by Day 4 (10 Aug).

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2022. All Rights Reserved.

Figure 1. Solar Analysis Valid 07/0800 UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2022. All Rights Reserved.

Met Office Space Weather Technical Forecast

Geomagnetic Storms:

There are no Earth-directed CMEs. Wind speeds are currently slightly elevated, likely due to a weak fast wind from CH09/+, which is a small coronal hole in the northwest disc. The most notable feature is large central disc coronal hole CH10/+. This is a persistent feature, but larger, darker and more distinct on this rotation. Expected fast wind arrival, based upon calculation from the leading edge of this feature, would suggest arrival on Day 3 (09 Aug), however 27-day persistence indicates a slight enhancement from late on Day 2 (08 Aug). Given the more intense appearance of this feature, a faster arrival seems more likely than a slower one, suggesting an arrival on Day 2 is most likely. Enlil also has one broad arrival, providing additional confidence for reduced time between CH09 and CH10 fast winds, with solar winds likely reaching around 550-600 km/s.

Geomagnetic activity will initially be Quiet to Unsettled with Active spells possible, with a slight chance of isolated G1/Minor Storm intervals on Day 1 due to CH09 fast wind. Activity rising to Unsettled to Active with G1/Minor Storm intervals likely when CH10 fast wind arrives, likely Day 2. Easing to Quiet to Unsettled by Day 4 (10 Aug).

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	10	60	30	5
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

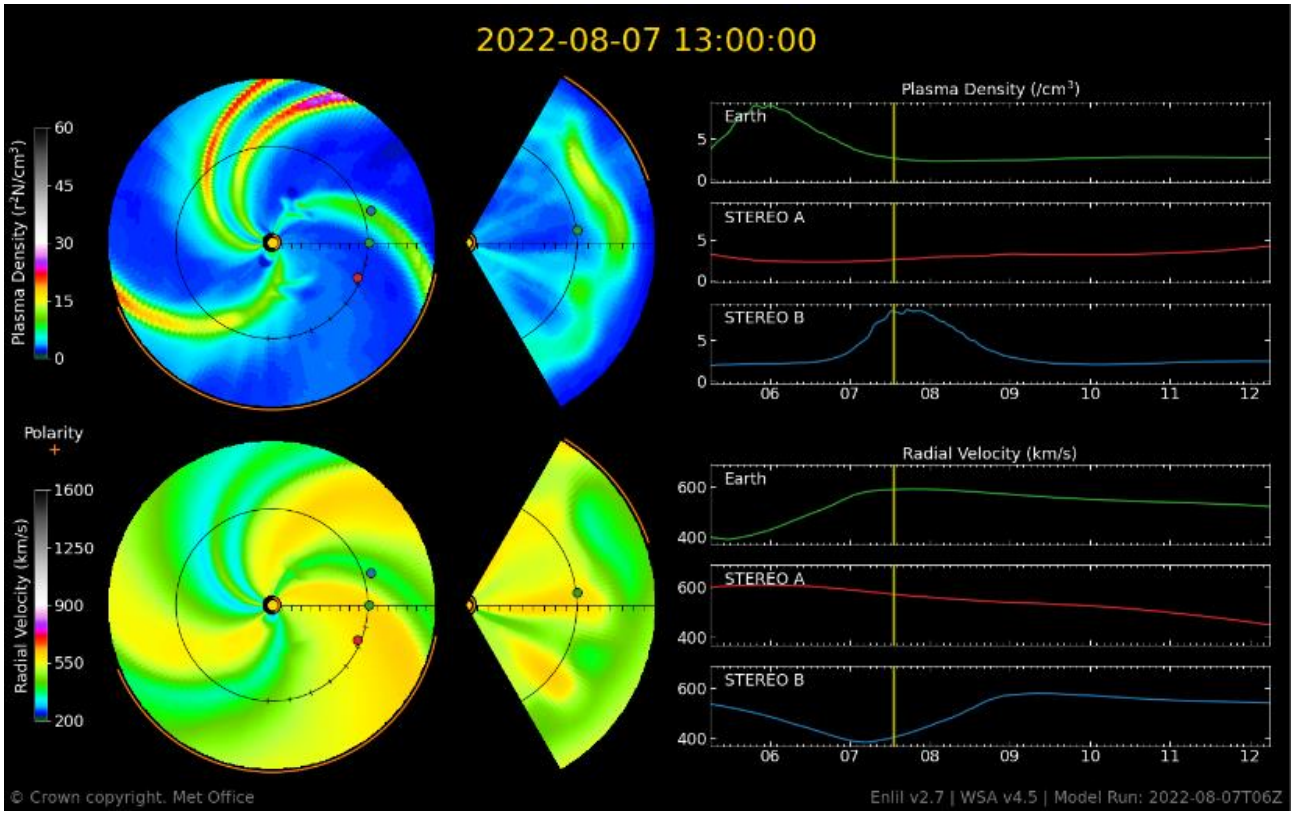
Geomagnetic Activity - Earthbound Coronal Mass Ejections

Date/time 21.5R (UTC)	Halo: Full or Partial	Source	Source Location	Estimated Speed	Estimated Arrival Time	Comments
*	*	*	*	*	*	*

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2022. All Rights Reserved.

Figure 2: MOSWOC Enlil model showing a broad fast wind continuing for several days. This may be a little too broad with a likely further increase from current slightly elevated levels on Day 2 (08 Aug).



Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2022. All Rights Reserved.

Radio Blackouts - X-Ray Flares:

There are currently seven sunspot regions on the Earth-facing disc. Despite this, activity has been Very Low in the last 24 hours, with only B-class flares observed.

The three active regions in the southwest remain small and relatively simple magnetically, with only limited development, however they have been the main source of the B-flares. These are now moving beyond 60W, and therefore becoming harder to analyse. There are also two stable unipolar regions in the southeast quadrant. Two further regions have recently rotated onto the northeast limb and these include a small beta region and a larger currently unipolar region. Both regions could yet reveal further details as they rotate further onto the disc and become more clearly visible. Low to Very Low activity is expected, with further C-flares likely, and a slight chance of M-flares.

X Ray Flares / Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**R1-R2 M Class**	No	10	10	10	10
Very Active	**R3 to R5 X Class**	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) is currently at Background levels, and is expected remain at this level through the period.

Radiation Storms / Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	1	1	1	1
Very Active	**≥ S3 ***	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

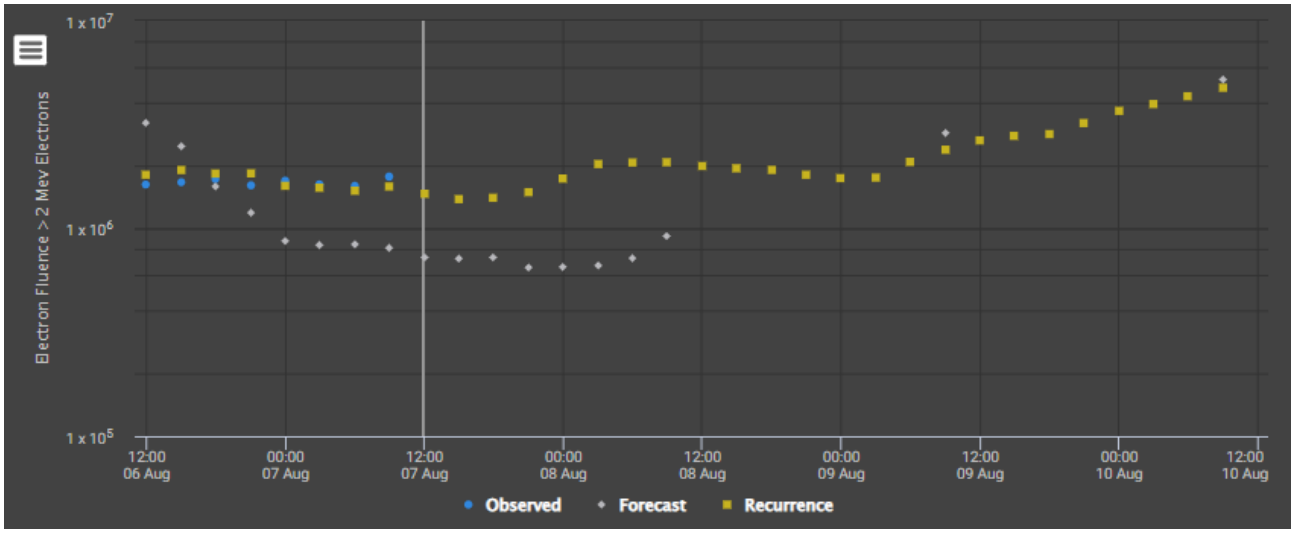
© Crown Copyright 2022. All Rights Reserved.

High Energy Electrons Event (≥ 2MeV):
The high energy electron flux (greater than 2 MeV) as measured by GOES-16, is currently at background levels. Despite the current weak enhancement to the solar wind environment from the fast wind of CH09, electron populations amongst the Van Allen Belts are expected to only slightly rise as a result. A more notable enhancement is then expected Day 2 (08 Aug), with the fast wind of CH10/+. Flux levels are then expected to rise from Day 3 (09 Aug) onward, perhaps peaking at high during periods of diurnal maximum.

The associated fluence is expected to start below the Active threshold, but with a rising trend, and a chance of rising above the Active threshold by the end of Day 4 (10 Aug). This rising trend, perhaps above the Active threshold, is likely to continue beyond the period. This is supported by REFM, which maintains levels below Active, but with a rising trend by the end of the period.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	1	5	20	30
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

Figure 3: MOSWOC REFM showing an increase in fluence but remaining below Active (1e8 integrated pfu) levels. This is considered good guidance.



Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2022. All Rights Reserved.